

We Claim

1. An all-optical bistable device, comprising:
  - a) a splitting device having first and second inputs and first and second outputs, for receiving first light beam at said first input and directing said first beam as second and third beams propagating through respective first and second outputs;
  - b) first optical path between said first output and said second input and second optical path between said second output and said second input for creating combined optical path for said first and said second beams at said second input;
  - c) said combined optical path includes a saturable optical amplifier for enhancing and diminishing one of said second and said third beams for driving said optical amplifier into a saturation state to create one of two stable states in which one of said second and said third beams is an enhanced beam and the other beam is a diminishing beam;
  - d) at least one tapping device for tapping output signal from one of said first and said second optical paths, and
  - e) at least one coupling device for coupling input signal into one of said first and said second optical paths to flip between said two stable states by converting said enhanced beam into said diminishing beam.
2. The bistable device of claim 1 wherein said splitting device is a beam splitter.
3. The bistable device of claim 1 wherein said splitting device is a directional coupler.

4. The bistable device of claim 1 wherein said bistable device is made of optical fibers.
5. The bistable device of claim 1 wherein said bistable device is made of optical planar waveguides.
6. The bistable device of claim 1 wherein said optical amplifier is a solid state optical amplifier.
7. The bistable device of claim 1 wherein said at least one of said first and second optical paths includes a phase shifter.
8. The bistable device of claim 1 wherein said combined optical path includes a phase shifter.
9. The bistable device of claim 1 wherein said combined optical path includes an attenuator.
10. The bistable device of claim 1 wherein said tapping device selected from a group of beam splitters and directional couplers.
11. An all-optical bistable device, comprising:
  - a) first comparator having first activating input, first threshold input and first clamping output, said first comparator arranged to produce a high level clamped output signal at said first clamping output when the signal at said first activating input is stronger than the signal at said first threshold input and to create a low level output signal at said first clamping output when the signals at said first activating and said first threshold inputs are similar;
  - b) second comparator having second activating input, second threshold input and second clamping output, said second comparator arranged to produce

a high level clamped output signal at said second clamping output when the signal at said second activating input is stronger than the signal at said second threshold input and to create a low level output signal at said second clamping output when the signals at said second activating and said second threshold inputs are similar;

- c) first optical path between said first clamping output and said second threshold input and second optical path between said second clamping output and said first threshold input for creating one of two stable states in which one of said first and second clamping outputs produces said high level clamped output signals and the other clamping output produces said low level signal;
- d) at least one taping device for taping output signal from one of said first and said second optical paths, and
- e) at least one coupling device for coupling input signal into one of said first and said second optical paths to flip between said two stable states by converting said high level clamped output signal into said low level signal.

12. The bistable device of claim 11 wherein said first and second comparators include splitters and optical amplifiers.

13. The bistable device of claim 12 wherein said splitter selected from a group including beam splitters and directional couplers.

14. The bistable device of claim 12 wherein said optical amplifier is a solid state optical amplifier.

15. The bistable device of claim 12 wherein said clamped output signal is produced by saturated said optical amplifier.
16. The bistable device of claim 11 wherein said bistable device is made of optical fibers.
17. The bistable device of claim 11 wherein said bistable device is made of optical planar waveguides.
18. The bistable device of claim 11 wherein said at least one of said first and second optical paths includes a phase shifter.
19. The bistable device of claim 11 wherein said tapping device selected from a group of beam splitters and directional couplers.
20. The bistable device of claim 11 wherein said coupling device selected from a group of beam splitters and directional couplers.